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DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Improvements relating to Vehicle Wheel Suspensions with Wheel Pressure Compensation, particularly for Cross-Country Motor Vehicles.

We, DAIMLER - BENZ AKTIENGESELLSCHAFT, of Stuttgart-Untertürkheim, Germany, a Company organised under the laws of Germany, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a vehicle wheel suspension with wheel pressure compensation for the wheels on the same wheel axis and/or the same vehicle side, particularly for cross-country motor vehicles, wherein the wheels are guided on the vehicle frame and each wheel is sprung in relation to the frame by a spring member, the spring member and/or its support on one wheel being connected to the spring member and/or its support on the other wheel on the same axis and/or on the same side.

Wheel suspensions of the above described type, which in principle are conceivable for independent wheel suspension and for rigid axles as well as with all spring systems, have disadvantages including the fact that the vehicles may overturn under certain operating conditions, for example when cornering at speed. In addition, the disadvantage exists that a shock-like deflection of one wheel is transmitted non-resiliently in the form of a shock to the other wheel.

The aim of the invention is to eliminate the above described disadvantages. In wheel suspensions of the above described type this aim is achieved by having the connecting means between the wheels securable and thus rendered immovable in relation to a rigid part of the vehicle, for example the vehicle frame, by means of a securing device, and comprising two or more parts connected to each other in resiliently yieldable manner.

[*Price 4s. 6d.*]

The invention provides the advantage that the wheel pressure compensation, which in itself is desirable under cross-country conditions, can be dispensed with under certain running conditions, such as for example high speed running on roads or else for example when running on a slope. The overturning of the vehicle is thereby reliably prevented. In addition, shocks can no longer be transmitted from one wheel to the other since they are absorbed by the resiliently, yieldable connecting means.

The invention is applicable to any desired axle suspension and also to any desired spring system, including for example pneumatic or hydropneumatic springs, that is to say apart from rigid parts the connecting means may be pressure media, particularly liquids. The invention also similarly includes the locking of the spring support on one wheel while in that case a rigid connection is made to the other wheel. It should also be observed in this connection that the invention may also be applied to the tread rollers of tracked vehicles and for this reason the term wheel as used in the claims of this Specification is intended to cover roller.

Wheel suspensions are already known in which the spring members are supported on levers and the levers of each pair of wheels are connected together by a rod constituting the connecting means. In one form of construction in accordance with the invention said rod has a collar or the like and the securing device consists of two stops which are disposed one on either side of the collar and the distance of which from the collar is separately or jointly adjustable. This form of construction is simple. The movability of the collar may be limited in

any desired manner and to the point of clamping the collar fast between the two stops, whereby complete elimination of the wheel pressure compensation is achieved. The stops may be brought close to the collar in an asymmetrical manner instead of symmetrically, whereby one direction of movement is given preference.

In a preferred embodiment of the invention a two-armed lever is articulated at one end to a rod constituting said connecting means and has a free end lying between the two stops of the securing device. The stops may be provided with an elastic covering; harsh striking against the stops is thereby avoided in an advantageous manner.

In another preferred embodiment of the invention the securing device is constructed after the style of a hydraulic shock absorber having two chambers, in which device the connecting means, for example of rod form engages by a piston or the like means, the passage of liquid from one chamber to the other being able to be throttled in a manner known *per se*. This throttling may go as far as complete blocking. Very delicately stepped control of wheel pressure compensation is possible with this embodiment.

In the simplest case the connecting means consists of two rods disposed in alignment with one another and supported against one another through an interposed spring. Other arrangements are conceivable, including for example deflector and/or angle levers. Depending on the direction of the force in the rod, the spring may be in the form of a tension or compression spring. According to a preferred embodiment two springs are disposed on the end of one of the rods, the remote ends of said springs bearing against collars on said rod, while their adjacent facing ends are supported against a disc which is fastened in the tubular end of the other rod. In all these arrangements the provision of damping means associated with the springs is in principle conceivable.

The connecting means may also consist of two rods disposed in alignment with one another, the end of one rod being constructed as a cylinder and the end of the other rod as a piston, the two rods cooperating after the style of a shock absorber as is one of the aforementioned forms of the securing device. Here again the throttling is advantageously regulable to the extent of completely blocking the passage of liquid through the piston.

A preferred further development of the invention consists in that the adjustment of the stops in the securing device and the throttling in the resilient connection inserted in the connecting means at the connection point can be controlled by a common control means in such a manner that both reach their rigid end position together. In this manner the rigid securing is advantageously prevented from acting only on one part of the connecting rod or other connecting means.

For the association of damping means with the resilient connection in the connecting means it is preferred that first and second rods constituting the connecting means contain side by side spring means and a member similar to a shock absorber, in such a manner that a first rod end is constructed in cylindrical form with two chambers and the second rod end engages by means of a piston in one chamber, while in the other chamber a spring is disposed which is supported on the one hand on a chamber wall and on the other hand on a collar on the second rod. Here again the throttling may be regulable.

Another embodiment of the invention comprises an arrangement in which plunger-like ends of the first and second rods constituting the connecting means engage in chambers in a third portion in which springs are disposed and supported at the piston ends and at a common partition in the third portion, the third portion itself being securable by the securing device. At the position of the intermediate wall, i.e. the common partition, the third portion advantageously has on its outside a piston-like collar which engages in a stationary cylinder and which has throttle apertures for the passage of the liquid from one side to the other.

This latter embodiment combines constructionally the securing device with the resilient connection in a simple manner. It permits the separate or joint engagement and throttling of the two devices, so that the suspension conditions, which will be more fully described hereinbelow, can be achieved.

Embodiments of the invention are illustrated as examples in the accompanying drawing, in which:

Figure 1 shows a wheel suspension diagrammatically,

Figures 2, 3 and 4 illustrate respectively three forms of construction of spring connection, and

Figure 5 illustrates in section a form of construction of the resilient connection and securing device.

Figure 5 illustrates in section a form of construction of the resilient connection and securing device.

According to Figure 1, each wheel 10 is guided on the vehicle frame 12 by a wheel guide member 11 and supported by a coil spring 13 on a lever 14 which is likewise mounted fast on the frame. The levers 14 of the two wheels are connected together by a connecting rod 15. This connecting rod 15 normally serves for wheel pressure compensation by transmitting the spring force of one wheel to the spring member of the other.

The rod 15 consists of two parts 16 and 17, each of which is connected to the other by a resiliently yieldable connecting device 18, details of the construction of which will be described later.

On the rod 15, which in the usual construction of the wheel pressure compensating device is constructed as a continuous one piece rod, there is articulated, approximately at its mid-length, a two-armed lever 19 which in turn is pivotally mounted on the vehicle frame 12 and whose free end 20 lies between stops 21 and 22. By means of two spreader pistons 24 and 24*a* disposed in a cylinder 23, said stops can be moved towards one another in such a manner that the movability of the lever 19 is restricted increasingly from both directions, and in the limit position is clamped fast between the two stops 21 and 22. The lever 19 is thereby rigidly secured to the frame, so that the rod 15 can no longer effect wheel pressure compensation.

An arrangement corresponding to that of Fig. 1 can also be provided in the case of a rigid axle extending between the wheels through which axle the wheels are guided in known manner.

According to Figure 2, the resiliently yieldable connecting device 18 in the rod is so shaped that the end of the rod 16 is constructed as a cylinder and has a central collar 25. The rod 17, which has two collars 26 and 27, engages in this cylinder. Coil springs 28 are disposed between the aforesaid collars 25, 26 and 27. Shocks applied to one wheel can thus be transmitted resiliently, instead of directly to the other wheel.

Whereas the construction illustrated in Figure 2 will always be selected when, as in the case of Figure 1, the rod 15 is subjected to tension, Figure 3 illustrates a resiliently yieldable connecting device for a connecting rod subjected to compressive stresses. In this case the end of one rod part 29 is again constructed as a cylinder. A spring 30 bears against the bottom of the cylinder and the end of the other rod 31, which engages in said cylinder. The mode of operation is in principle the same as has already been described above.

Figure 4 illustrates a further connecting device for a connecting rod and containing a spring member and damping means side by side. This is achieved by providing the end of one rod part 36 with a piston 37 by which it engages in one chamber 38 of the cylindrically constructed end of the other rod part 39. In a second, juxta-posed chamber 40 a spring 41 is disposed which is supported between a collar 42 on the rod part 36 and the end wall 43 of the rod part 39. The chamber 38 is filled with liquid after the style of a shock absorber and the piston is provided in known manner with throttle bores, which may likewise be regulable, likewise in known manner. The regulation is effected by the rod part 36 in this case.

Figure 5 illustrates a form of connecting and securing device. Two rod parts 44 and 45 engage by their blunt ends in a third, hollow rod part 46 which in the middle has a partition 47. In the two chambers 48 and 49 formed in this manner, coil springs 50 are disposed in the manner illustrated in Figure 3. In addition, these chambers are filled with liquid, which can pass through throttle bores 51 in the partition, in a manner known *per se*, from one chamber into the other. The throttle bores 51 are regulable, the regulation being effected by the admission of a pressure medium through the pipe 52.

The third rod part 46 has at its centre an external collar 53 which is disposed like a piston in a cylinder 54 which is secured on the frame 12. The collar 53 is once again provided with throttle bores 55, which can be regulated by the pipe 56. Together with the cylinder 54, the collar 53 forms the securing device.

The mode of operation of the arrangement illustrated in Figure 5 is as follows If all the throttle bores are open, wheel pressure compensation is effected the springs 50 acting as a resiliently yieldable connecting device This wheel pressure compensation can be adjusted by pressure on the pipe 52, up to a rigid wheel pressure compensation. If the pipe 56 is placed under pressure, the movability of the third rod part 46 is increasingly hindered. As a final effect, said third part can be fastened rigidly to the frame so that, provided that the pipe 52 is under full pressure, rigid securing and hence elimination of wheel pressure compensation are effected. If on the other hand while pressure is applied to pipe 56 the pipe 52 is relieved of pressure, in consequence of the securing of the third rod part 46 the wheel pressure compensation is blocked and the springs 50 serve as additional springs for each wheel separately.

WHAT WE CLAIM IS:—

1. A vehicle wheel suspension with wheel pressure compensation for the wheels on the same wheel axis and/or vehicle side, wherein the wheels are guided on the vehicle frame and each wheel is sprung in relation to the frame by a spring member, the spring member and/or its support on one wheel being connected to the spring member and/or its support on the other wheel on the same axis and/or the same vehicle side, and wherein the connecting means between the wheels is securable and thus rendered immovable in relation to a rigid part of the vehicle, for example the vehicle frame, by a securing device and the connecting means consists of two or more parts connected in

resiliently yieldable manner to each other.

2. A vehicle wheel suspension as claimed in Claim 1, wherein each wheel is guided on the vehicle frame by at least one wheel guide member.

3. A suspension according to Claim 1 or 2, and having the spring members supported by levers which are connected together by a rod constituting said connecting means, wherein said rod has a collar or the like and the securing device consists of two stops, which are disposed on either side of said collar and whose distances from the collar are separately or jointly adjustable.

4. A suspension according to Claim 1 or 2, and having the spring members supported by levers which are connected together by a rod constituting said connecting means, wherein a two-armed lever is articulated to said rod and has a free end which lies between two stops constituting said securing device and whose distances from said free end of said two-armed lever are separately or jointly adjustable.

5. A suspension according to Claim 3 or 4, wherein the stops are provided with an elastic coating.

6. A suspension according to Claim 1 or 2, wherein the securing device is constructed after the style of a hydraulic shock absorber having two chambers, in which said connecting means engages by piston or the like means, it being arranged that the passage of damping liquid from one chamber into the other is able to be throttled.

7. A suspension according to any one of the preceding claims, wherein the connecting means consists of two rods disposed in alignment with one another and supported against one another through interposed spring means.

8. A suspension according to Claim 7, wherein on the end of one rod are disposed two springs the remote ends of which lie against collars on the rod, and the adjacent facing ends of which are supported by a collar in a tubular end of the other rod.

9. A suspension according to any one of Claims 1 to 6, wherein the connecting means consists of two rods disposed in alignment with one another, the end of one rod being constructed as a cylinder and the end of the other as a piston disposed in said cylinder to provide a resilient connection between said two rods in the form of a shock absorber.

10. A suspension according to any one of the preceding claims, wherein adjustment of the securing device and of the resilient connection inserted in the connecting means is controllable by a common control means in such a manner that both reach their rigid end position together.

11. A suspension according to Claim 7, wherein said two rods constituting the connecting means have side by side said spring means and a device similar to a hydraulic shock absorber, by reason of the end of one rod end being constructed as a cylinder having two chambers, the end of the other being constructed as a piston engaging in one chamber and said spring means being disposed in the other chamber and being supported at one end by the chamber wall and at the other end by a collar on said other rod.

12. A suspension according to Claim 1 or 2, wherein plunger-like ends of first and second rods constituting the connecting means engage in respective chambers of a third part of the connecting means in which chambers springs are disposed and supported against the plunger ends and a common intermediate wall in the third part, said third part being securable by the securing device.

13. A suspension according to Claim 12, wherein the third part has at the position of said common intermediate wall an external piston-like collar which engages in a stationary cylinder in the manner of a shock absorber displacement of liquid from the chamber on one side of said piston-like collar to the other being able to be throttled.

14. A suspension according to Claim 12 or 13, wherein said chambers in said third part contain liquid and said intermediate wall has bores through it, the passage of liquid through said bores being able to be throttled.

15. A suspension substantially as hereinbefore described with reference to and as shown in Figure 1, 2, 3, 4 or 5 of the accompanying drawing.

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1122515 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

Fig.1

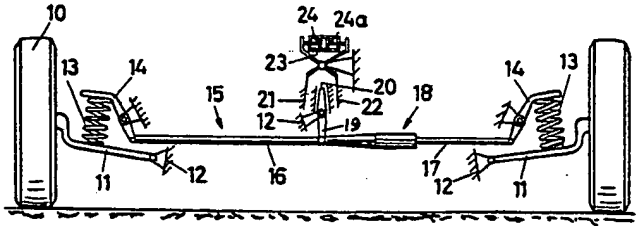

Fig.2

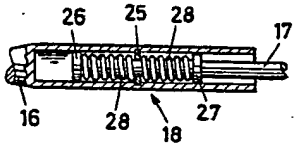

Fig.3

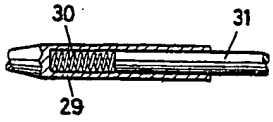

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Fig.4

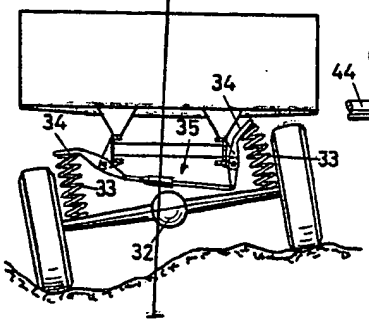
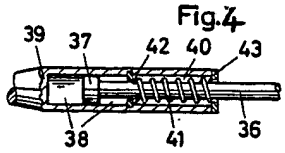


Fig.4



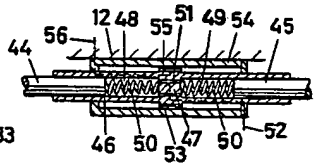


Fig.5